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Description

[AUTOMOTIVE SIDE IMPACT PROTECTION]

BACKGROUND OF INVENTION

[0001] The present invention relates generally to automotive side impact protection and more particularly to automotive side impact protection utilizing an improved window glass design.

[0002] Automotive design is charged with the ever-increasing development of new and improved methods of protecting occupants. The desire to expand the range of situations that both vehicle and occupants can withstand has driven the development of a plurality of accessories that may be implemented upon a vehicle. One such area of development has centered on the use of airbag devices. Airbag assemblies commonly operate by way of sensors that register vehicle impacts. In response to impacts of sufficient force and direction, airbags are inflated between the occupant and surrounding vehicle structures in order to

minimize occupant injuries.

[0003] The success of front air-bag assemblies has resulted in the expansion of the technology into more diverse applications. Side impact air-bags, for example, have been developed as one of a variety of responses to the desire to minimize injuries from side impact collisions. These air-bag systems are commonly mounted within the vehicle door structure or adjoining areas such that their inflation positions the bag between the occupant and the vehicle door. Various automotive designs and subsequent occupant position/vehicle relationships result in a variety of side air-bag storage and deployment positions. One unique configuration arises in vehicles incorporating relative high occupant seating. These vehicles, often SUVs or mini-vans, are configured such that the occupant's shoulders rise above the beltline (lower edge of the window).

[0004] An impact of many of these configured vehicles is that deployment of the side air-bag results in the air-bag being positioned between the occupant's shoulder and the vehicle side-window. Side air-bag deployment scenarios, however, often result in the damage or fracture of the vehicle side-window due to impact or even air-bag deployment. In such situations, the air bag may not be optimally

supported on the window deployment side at positions above the beltline in plane with the occupant's shoulder. This, in turn, may impact the optimal effectiveness of the deployed air-bag.

[0005] Improvements in effectiveness of the side air-bag may, in turn, be addressed by modifications of system design and configuration. Air-bag size and deployment volume may be modified to increase efficiency. Seat and window configuration may be modified such that relative passenger position is lowered or relative window beltline is raised. These solutions, however, present a significant impact on cost and design constraints. In addition, these modifications may run counter to additional design considerations such as passenger/driver viewing angles and field of view requirements. It would, therefore, be highly desirable to have an improved side air-bag system configuration that provided an increase in air-bag efficiency without large scale vehicle redesign considerations.

SUMMARY OF INVENTION

[0006] It is, therefore, an object of the present invention to provide an automotive side impact assembly with increased efficiency. It is a further object of the present invention to provide an automotive side impact assembly that may be

implemented at low cost.

[0007] In accordance with the objects of the present invention, an automotive side impact assembly is provided. The automotive side impact assembly includes a door assembly having a door body portion and a window opening portion. The door body portion and said window opening portion meet to form a beltline. A window assembly is positioned within the window opening portion and extends into the door body portion when in a window closed condition. An automotive seat assembly is positioned adjacent said door assembly. A side-impact air bag assembly is positioned within the automobile such that the side air-bag is deployed between the door assembly and the automotive seat. The side-impact air bag assembly has a deployed condition in which a side air-bag is deployed during a collision. A laminate assembly is in communication with the window assembly and has an upper portion extending above the beltline into the window opening portion when the window assembly is in the window closed condition. The laminate assembly has a lower laminate portion extending below the beltline into the door body portion when the window assembly is in the window closed position. The laminate assembly provides struc-

tural rigidity to the window assembly such that the side air-bag is supported during deployment.

[0008] Other objects and features of the present invention will become apparent when viewed in light of the detailed description of the preferred embodiment when taken in conjunction with the attached drawings and appended claims.

Brief Description of Drawings

[0009] FIGURE 1 is an illustration of an automotive side impact assembly in accordance with the present invention, the side impact air bag assembly shown in the pre-deployed condition.

[0010] FIGURE 2 is an illustration of the automotive side impact assembly illustrated in Figure 1, the side impact air bag assembly illustrated in the deployed condition.

[0011] FIGURE 3 is a detail illustration of the automotive side impact assembly illustrated in Figure 1.

[0012] FIGURE 4 is a cross-sectional illustration of an embodiment of the automotive side impact assembly illustrated in Figure 3, the illustration taken along the lines 4-4 in the direction of the arrows.

[0013] FIGURE 5 is a cross-sectional illustration of an alternate embodiment of the automotive side impact assembly illustrated in Figure 4.

[0014] FIGURE 6 is a cross-sectional illustration of an alternate embodiment of the automotive side impact assembly illustrated in Figure 4.

[0015] FIGURE 7 is a cross-sectional illustration of an alternate embodiment of the automotive side impact assembly illustrated in Figure 4.

DETAILED DESCRIPTION

[0016] Referring now to Figure 1, which is an illustration of an automotive side impact assembly 10 in accordance with the present invention. The automotive side impact assembly 10 is intended to be utilized in a wide variety of vehicles for a wide variety of specific configurations. Although the present invention can be utilized on a variety of vehicles, it is preferably designed for vehicles in which a passenger's shoulder is positioned adjacent the vehicle windows above the beltline.

[0017] The automotive side impact assembly 10 includes an automotive seat assembly 12 positioned within an automobile 14. A passenger 16 is positioned within the seat assembly 12 adjacent a door assembly 18. The door assembly 18 is comprised of a door body portion 20 and a window opening portion 22. The door body portion 20 and window opening portion meet to form a beltline 24. A

window assembly 26 is positioned within the window opening portion 22 and extends down into the door body portion 20 when the window assembly 26 is in the window closed position 28. This is an arrangement commonly utilized in automotive design.

[0018] The automotive side impact assembly 10 further includes a side impact air bag assembly 32 positioned to deploy between the passenger 16 and the door assembly 18. It is contemplated that the side impact air bag assembly 30 may be positioned in numerous locations within the automobile 14, although one embodiment contemplates mounting it within the door body portion 20 of the door assembly 18. In this fashion, when in the even event of a side impact collision, the side air bag 32 can be deployed into the deployed condition 34 (see Figure 2). In the deployed condition 34, the side air bag 32 is preferably positioned between the passenger 16 and the door assembly 18. In automotive designs wherein the passenger's shoulder 36 is positioned above the beltline 24, this can generate an impact zone 38 on the window assembly 26 at a position corresponding to the passenger's shoulder 36 (see Figure 3). The inflation of the side air bag 32 between the shoulder 36 and the impact zone 38 can create undue

stresses in the window assembly 26 of existing arrangements. Damage to the window assembly 26 in such situations may reduce the effectiveness of the side air bag 32 by removing lateral support in window breakage situations.

[0019] The present invention provides a cost effective an efficient method of improving the effectiveness of the side air bag 32 during deployment. This is accomplished through the use of a laminate assembly 40 in communication with the window assembly 26. The laminate assembly 40 is applied to the window assembly 26 in order to improve the structural rigidity of the window assembly 26 in and around the impact zone 38. The use of an applied laminate assembly 40 is not only relatively inexpensive, but it additionally can be applied at any of a number of situations during manufacturing and assembly. This provides the ability for selective application which can further reduce costs (such as the application only in side air bag 32 installation in seat positions indicating shoulder 36 position likely above the beltline 24). A variety of laminate materials and application procedures may be utilized to apply the laminate assembly 40 to the widow assembly 26. It is preferable that the laminate assembly 40 be translucent in nature so

as to minimize sight distortion through the window assembly 26. Similarly, it is contemplated that the laminate assembly 40 only extend upwards into the window assembly 26 from the beltline 24 in order to cover the impact zone 38, which may only require a quarter to half of the window assembly 26 height. This further minimizes sight distortion while maximizing structural rigidity of the window assembly 26.

[0020] The laminate assembly 40 is contemplated to have an upper laminate portion 42 extending above the beltline 24 into the window opening portion 22 and a lower laminate portion 44 extending below the beltline 24 into the door body portion 20. This further improves the structural rigidity of the window assembly 26 within the impact zone 38 by utilizing the door body portion 20 for added strength (see Figure 3). It is contemplated that the laminate assembly 40 may be applied to the outside surface 46 of the window assembly 26 (see Figure 4), the interior surface 48 of the window assembly 26 (see Figure 6), or both (see Figure 5). This provides for a broader range of laminate assemblies 40 that can be utilized for their structural rigidity properties or their viewing properties.

[0021] It is further contemplated that the laminate assembly 40

may be comprised of a variety of laminate portions 50 used in combination to provide the best combination of structural improvement and minimal view impact. As shown in Figure 6, a first laminate portion 52 can be used in combination with a second laminate portion 54 to generate a unique profile. The first and second laminate portions 52,54 have a respective first and second laminate strengths. This allows a tailored approach to structural improvement. Additional strength can be generated by applying the first laminate portion 52 bordering the window side edges 56. A reduced view distortion can be generated by positioning the second laminate portion 54, having improved translucence, in the window center 58. In this fashion a tailored strength/view characteristics can be generated. Although only two laminate portions 52,54 have been described, it should be understood that the present invention can be used with any number of individual laminate portions.

[0022] In a unique embodiment, it is contemplated that the laminate assembly 40 may be manufactured between a first window pain section 60 and a second window pain section 62. This allows the laminate assembly 40 to be protected from scratches or damage during usage. It may addition-

ally provide for a broader range of laminate materials as the window assembly 26 servers as a protection buffer for the laminate assembly 40. The laminate assembly 40 manufactured between the window pain sections 60,62 can again be of any of a variety of materials and may also consist of any number of laminate portions. In this way a broad range of structural rigidity characteristics can be imparted to the window assembly 26 without adversely increasing view distortion.

[0023] While particular embodiments of the invention have been shown and described, numerous variations and alternative embodiments will occur to those skilled in the art. Accordingly, it is intended that the invention be limited only in terms of the appended claims.